

Style check your document!

Professional writing skills are essential for a scientist.

To style-check your document, please go step by step through the following points and make sure your document complies with them. It is best to read through the page once completely before starting to write.

To begin with, view my [presentation on scientific writing on YouTube](#).

The paragraphs of this page are numbered (G.2.1.1.) to allow me to refer to them when I correct documents.

Table of contents with links:

- A. [Construction of the sections](#) of your document
 - B. [Use of material from elsewhere](#)
 - C. [Construction of sentences](#)
 - D. [Word choice, word use, word forms](#)
 - E. [Individual symbols](#)
 - F. [Formatting](#)
 - G. [Special notes for people from particular corners of the world](#)
 - H. [Before giving your document to anyone else](#)
 - J. [Further reading](#)
 - K. [Software](#)
-

A. Construction of the sections

Which sections should be in your document depends, of course, on what kind of document you have.

A.1. Introduction and discussion sections

- A.1.1. Each paragraph is one unit of the scientific argument, *i.e.*, it tries to convey one particular conclusion or 'take-home message'.
- A.1.2. At the beginning of each paragraph, there is a 'gate sentence' that prepares the reader for this conclusion. For example: "The intracellular localization of TAP has been much debated."
- A.1.3. At the end of the paragraph, the conclusion is usually made explicitly, and the last sentence provides the logical connection to the next paragraph.

A.2. Results section

- A.2.1. A results section consists of paragraphs. Each paragraph (usually) describes one experiment. Paragraphs of a results section are always built according to the following scheme:
 - a. Objective (what did we want to show next?)
 - b. Approach (what did we do?)
 - c. Results (what did we see?)
 - d. Interpretation (what does that mean?)
- A.2.2. All data that are mentioned in the Results section must be interpreted. Data that are not interpreted (*i.e.*, for which there is no conclusion) should not be mentioned.
- A.2.3. The results section is a place to describe the results with words, and to draw conclusions. Do not repeat the data (*e.g.*, numerical measurement values) in the text.

B. Use of material from elsewhere

- B.1. Write your text yourself, in its entirety. It is not allowed to copy and paste any text from any published source without acknowledgement. This includes papers and reviews from your own laboratory!
- B.2. If you use text from elsewhere, put it in quotation marks and make a proper reference.

- B.3. If you use any figures, tables, or data from published material, then make a proper reference. This is **not** allowed in PhD theses (since copyrighted material must not be republished, and PhD theses legally count as publications).

C. Construction of sentences

C.1. General construction issues

- C.1.1. Write **short and concise** sentences. Do not use complicated subclauses if at all possible.
- C.1.2. **The text should be as straightforward as possible** and use the **simplest constructions** that convey your meaning. Avoid constructions that you would not use in oral conversations. Do not duplicate words or statements.

	Write	and not:	Remarks:
C. 1.2. 1.	Peptides cannot be transported into the ER	peptide transport into the ER is hindered.	
C. 1.2. 2.	GFP-K ^b overlaps with the ERGIC.	GFP-K ^b shows a localization that is adjacent to that of the ERGIC.	
C. 1.2. 3.	From the preliminary results, it follows that...	From the preliminary results obtained so far, it follows that...	
C. 1.2. 4.	A influences B	A has been shown to influence B	
C. 1.2. 5.	A might influence B	It is conceivable that A might influence B	
C. 1.2. 6.	Using this method requires:	The use of this method requires at least two properties that must be fulfilled, namely the following.	
C. 1.2. 7.	<i>(nothing)</i>	This statement is complemented by the consideration that...	
C. 1.2. 8.	We can perform this assay.	It is an assay that is feasible under the conditions that are presently given in the said laboratory.	
C. 1.2. 9.	This protein is rapidly degraded.	This protein undergoes a strong degradation.	
C. 1.2. 10.	This differential retention of RAE-1 isoforms is attributed to a PLWY amino acid motif. <i>Or:</i> This differential retention of RAE-1 isoforms is most likely due to a PLWY amino acid motif.	This differential retention of RAE-1 isoforms is most likely attributed to a PLWY amino acid motif.	
C. 1.2. 11.	Interestingly,	It is interesting to mention that under the given conditions,	
C. 1.2. 12.	The soluble form of gp40 can still retain class I.	Studies have shown that the soluble form of gp40 can still retain class I.	
C. 1.2. 13.	Complement control proteins include CD35, CD46, DAF, and CD59.	Complement control proteins include CD35, CD46, DAF, and CD59, among others.	The idea that there are more than these four proteins is already present in the word 'include', so 'among others' is not necessary.

- C.1.3. Use **the active voice**. (Exception: Results section, when experiments are described.)

Write:	and not:
Tapasin mediates peptide editing.	Peptide editing is mediated by tapasin.
Read	For appreciating our findings, it is essential that the two terms are clearly introduced, differentiated, and understood by the readers.

- C.1.4. Use of the **first person** is appropriate and supports a concise style. If you don't use the first person then it is harder for someone to figure out whether you did it, someone else in the group who is not on the paper did it, or someone else in the field did it.

Write:	and not:
We have previously shown that ...	It was previously shown by our group that...
We next investigated the association of the two proteins in cells.	Next, the association of the two proteins in cells was investigated.

- C.1.5. Be **explicit and specific**. Say plainly what you mean to say, and use the most specific words available to you. Do not leave any of your vital conclusions open to the reader's interpretation.

	Write:	and not:	Remark:
C. 1.5. 1.	Since the authors showed two different fields of cells without overlaying them, it is difficult for the reader to independently assess the degree of colocalization.	They just showed two fields of cells.	
C. 1.5. 2.	The energy analysis shows that the binding free energy decreases when the peptide C terminus is truncated.	The energy analysis shows the highest impact on binding free energy when the peptide C terminus is truncated.	'decrease' is much more specific than 'impact on'.
C. 1.5. 3.	MHC class I molecules transport peptides of viral and tumor origin to the cell surface so they can be recognized.	MHC class I molecules play an important role in the recognition of viral and tumor epitopes.	The sentence 'MHC class I molecules play an important role in the recognition of viral and tumor epitopes.' would work as the introduction of a long paragraph on class I antigen presentation.
C. 1.5. 4.	We co-immunoprecipitated gp40 in digitonin. <i>OR</i> : We co-immunoprecipitated gp40 in digitonin, a mild detergent.	We co-immunoprecipitated gp40 in a mild detergent.	Why not name the detergent?
C. 1.5. 5.	What is the structure of the complex between gp40 and tapasin?	How does gp40 bind to tapasin?	'How does gp40 bind to tapasin?' could be a question about the kinetics, the structure, the dynamics, binding partners, ...
C. 1.5. 6.	This can be tested by inhibiting the proteasome in cells that lack TMED10.	Hence, a closer look after proteasomal inhibition is warranted.	

- C.1.6. The **beginning of a sentence is important**. Do not start your sentences with a **qualification** (=restriction of a statement) such as "Even though..., However,...". Bring the main statement first and the qualification later. Do not use weak and meaningless words to start a sentence.

C.1.6.1. Good words to start sentences with:	C.1.6.2. Bad words to start sentences with:
Interestingly, Importantly, In agreement with this observation, In apparent contradiction, Alternatively, We next wished to investigate...	Moreover, ... Actually, ... Despite ..., Even though..., Notwithstanding..., However, And... But... Anyway, Furthermore, ... Also, ... As..., In fact, ... Additionally, ...

- C.1.7. The words **'however'** and **'but'** may only be used in the beginning of a sentence if there is a real discrepancy of meaning to the previous sentence (i.e., if the contents of the two sentences contradict each other). It must not be used to simply continue the narration. If, for example, two proteins have different properties, write instead 'In contrast, ...'.
- C.1.8. Use **basic logic** when constructing your sentence - they must make sense. Here are a few examples from actual documents, with critique:

No sense:	Critique:	Improvement:
Immuno-evasins from the mCMV broadly follow two strategies.	Immuno-evasins are proteins, not persons. Thus, they cannot 'follow a strategy'.	Immuno-evasins ... function in two different ways.

- C.1.9. Avoid duplicate statements.

	Write:	and not:	Remarks
C. 1.9. 1.	The surface of polyelectrolyte microcapsules can be further modified with proteins.	Additionally, the surface of polyelectrolyte microcapsules can be further modified with proteins.	The 'additionally' (anyway a bad way of starting a sentence) duplicates the 'further'.
C. 1.9. 2.	Other substrates are DNA or proteins.	Other substrates are DNA, proteins, etc.	The 'etc.' duplicates the 'other'.

- C.1.10. Here are some excellent phrases to use in scientific writing: <http://www.phrasebank.manchester.ac.uk/>

C.2. Cases, tenses, and word forms in sentence construction

C.2.1. Use of conditionals

- C.2.1.1. To indicate possibility, use the forms 'can', 'may', or 'might' instead of 'could'.

Write:	and not:
The optimal exposure time may vary from a few hours to several weeks.	The optimal exposure time might vary from a few hours to several weeks.

- C.2.1.2. Generally **avoid use of 'should', 'could', and 'would'** because of possible confusion between the past tense and the conditional future.

Write:	and not:
The same phenomenon was observed with another allotype.	The same phenomenon could be observed with another allotype.
The proteins then become EndoH resistant.	The proteins would then become EndoH resistant.
This result might be used in biotechnology.	This result could be used in biotechnology.
We concluded that the poorly loaded mutant B27 molecules dissociate rapidly and constantly following their arrival at the surface.	We concluded that the poorly loaded mutant B27 molecules should be dissociating rapidly and constantly following their arrival at the surface.

- C.2.1.3. It is often more precise to use **'suggest'** to indicate a conditional.

Write:	and not:
These data suggest that frogs have four legs.	Frogs may have four legs.

- C.2.1.4. Avoid **double and multiple conditionals**.

Write:	and not:
These data suggest that there is an intermediate. <i>Or:</i> These data mean that there might be an intermediate.	These data suggest that there could be an intermediate.
The following interpretation is possible.	One might think that this interpretation could be possible.

C.2.2. Nominal style

- C.2.2.1.. Avoid **nominal style** (characterized by many nouns and weak verbs).

Write:	and not:
When the protein was added, the color of the solution became stronger.	The addition of the protein caused a deepening of the color of the solution.
There are no crystal structures of empty class I molecules.	There is a lack of crystal structures of empty class I molecules.

C.2.3. -ing

- C.2.3.1. The **"-ing"** form can cause confusion because of its unclear reference noun, and it always breaks the flow of the sentence. Avoid it.

Write:	and not:	Remark:

C. 2.3. 1.	experiments that show colocalization	experiments showing colocalization	
C. 2.3. 2.	When one considers the following reaction scheme, ...	Considering the following reaction scheme, ...	
C. 2.3. 3.	The experiment was done with water.	The experiment was done using water.	
C. 2.3. 4.	Therefore, we speculated that the B27 disulfide mutant might lose the beta-2 microglobulin after reaching the cell surface. <u>In support of this theory</u> , we have recorded almost four times higher HC-10 signal from STF cells expressing the disulfide mutant as compared to the wild type B27.	Therefore, we speculated that the B27 disulfide mutant might lose the beta-2 microglobulin after reaching the cell surface. <u>Supporting this theory</u> , we have recorded almost four times higher HC-10 signal from STF cells expressing the disulfide mutant as compared to the wild type B27.	Who supports? We? The mutant? The observation?

C.2.4. Tenses (times)

- C.2.4.1. Observations from the literature or prior work are in the **present perfect tense**: "Tapasin has been detected on the membranes of the Golgi apparatus."; "Hoof *et al.* have shown that epitopes can be predicted."; "In this chapter, we have shown that gp40 binds to class I." See (http://en.wikipedia.org/wiki/Present_perfect_tense). But, if referring just to the scientific content, it is better to use the present tense: "TAP transports peptides into the ER."; "MHC Class I molecules present peptides to CTL."
- C.2.4.2. Experimental approaches from the literature are described in the **past tense**. "Martin Zacharias was the first person to perform MD simulations on MHC class I molecules." "The group of Wiley released class I molecules from the cell surface with papain."
- C.2.4.3. Descriptions of what you did in the time of the report are in the simple **past tense**, and often in the passive voice. "The protein was purified to homogeneity." This includes the description of experimental results in the results section of any report or manuscript.
- C.2.4.4. Conclusions from your own work, or hypotheses, are in the **present tense**. "We conclude that p36 binds to p58 in the nucleus."; "This suggests that the two subunits associate in the *cis*-Golgi."
- C.2.4.5. Descriptions of what you are proposing to do are in the **future tense**. "We will generate antibodies against p46".
- C.2.4.6. The **present continuous tense** ("I am going home") and the **future continuous tense** ("I will be performing the assay") are not normally used in scientific documents.
- C.2.4.7. Within one paragraph, keep the tense as constant as possible to avoid confusing the reader.

C.3. Signs and symbols in sentence construction

C.3.1. Brackets

- C.3.1.1. Brackets take small explanations of one particular word or expression, but never an entire sentence. If you have to write a sideline sentence (or several), use a footnote instead.
- C.3.1.2. A bracket is a sideline. Do not use a bracket if the word in the bracket is used again in this or the next sentence.

Write:	and not:
Our attempts to show the sufficiency of the linker in retaining an unrelated protein, CD4, have proven unsuccessful. Thus, CD4 is unsuitable.	Our attempts to show the sufficiency of the linker in retaining an unrelated protein (CD4) have proven unsuccessful. Thus, CD4 is unsuitable.

- C.3.1.3. There is never a period before a bracket. Only exception: if the bracket contains a full sentence.

Write:	and not:	Remarks
Tapasin is a chaperone for class I molecules (Garstka, 2011).	Tapasin is a chaperone for class I molecules. (Garstka, 2011).	

C.3.2. Dashes/hyphens and minus signs

- C.3.2.1. With a certain combination of words, always either use a dash (steady-state) or not (steady state). Do not mix these forms in the document.
- C.3.2.2. When connecting words with hyphens, use no space in front and after the dash (steady-state).
- C.3.2.3. When making a parenthesis with dashes - such as this - always use a space in front and after each dash.
- C.3.2.4. The minus sign directly in front of a number is not separated by a space.
- C.3.2.5. There is a space before and after an equals sign (i.e., "CTL = cytotoxic T lymphocytes").
- C.3.2.6. Handle dashes and minus signs consistently throughout your document.

C.3.3. Spaces

- C.3.3.1. Before an opening bracket and behind a closing bracket, there is a space.
- C.3.3.2. There is **one** space between sentences (not zero, not two).

C.3.4. Commas

- C.3.4.1. In American English (which we use), there is always a comma after the penultimate object of an enumeration: write "bacteria, yeast, and mammalian cells" not "bacteria, yeast and mammalian cells". (This is called the 'Oxford comma', and it makes sentences easier to read.)
- C.3.4.2. There is always a comma after an initial "Therefore", "Thus", "Interestingly", "Finally", and similar at the beginning of a sentence: write "Thus, protein expression was best at OD 1" .
- C.3.4.3. There is always a comma or a period between two complete sentences.
- C.3.4.4. There is no comma if the following sentence is incomplete, *i.e.*, has no subject of its own.

Write:	and not:
All other allotypes have this motif, and RAE-1 becomes susceptible to gp40 upon introduction of this motif.	All other allotypes have this motif and RAE-1 becomes susceptible to gp40 upon introduction of this motif.
Applying this method addresses the sampling problem and leads to a better understanding of the conformational changes.	Applying this method addresses the sampling problem, and leads to a better understanding of the conformational changes.

- See the [Wikipedia article](#).

C.3.5. Apostrophes

- C.3.5.1. Do not write "don't", "didn't", "can't", or other forms with an apostrophe. Write "do not", "did not", "cannot", etc.

C.3.6. Cross-references

- If you refer to other parts of your document, never use page numbers (since they will shift during editing). Instead, refer to "the introduction" or "section 4.4". If you refer to section numbers, it is a good idea to use the dynamic 'Cross-reference' function of Word to refer to 'Outline numbered' sections.

C.3.7. Lists

- C.3.7.1. The individual entries of **lists** must correspond to each other in style.
- C.3.7.2. Do not use numbered lists in the flowing text. Instead, write 'First, ...; second, ...; third, ...', etc, or find a different way to express your series.

Write:	and not:
The studies are divided into two major approaches, namely on one hand, the investigation of TMED2/TMED10 as dimers and on the other hand, the study of individual proteins like TMED2 or TMED10 using domain swaps with CD8.	The studies are divided into two major approaches, (i) the investigation of TMED2/TMED10 as dimers and (ii) the study of individual proteins like TMED2 or TMED10 using domain swaps with CD8.

C.3.8. Footnotes and endnotes

- C.3.8.1. Superscript **footnotes and endnotes** always come before a point or comma.

	Write:	and not:
C.3.8.1.1.	This was also shown by Miller ³³ .	This was also shown by Miller. ³³
C.3.8.1.2.	The data, as published by Smith ²² , allow two interpretations.	The data, as published by Smith, ²² allow two interpretations.

D. Word choice, word use, word forms

D.1. Word choice - general issues

D.1.1. **Be as specific as possible**, unless you actually mean to make a general statement. For every single word, think whether one exists that is more specific. Some examples:

Write	and not:
H-2D ^b	class I
our observation	the observation
these proteins	these molecules

D.1.2. Use correct and precise words.

- D.1.2.1. Use correct quantification adjectives.

	Write:	and not:	Explanation:
D. 1.2.1. 1.	a large number of points	a large amount of points	Points are countables . The word 'amount' is synonymous with 'Quantity' and can only refer to uncountables.
D. 1.2.1. 2.	high and low temperatures	large and small temperatures	Temperatures can only be high or low (they are numerical values), not large or small.
D. 1.2.1. 3.	A binds B with high affinity	A binds B with strong affinity	Affinities are numerical values, they can only be high or low.
D. 1.2.1. 4.	high and low speeds	fast and slow speeds	Speeds can only be high or low (they are numerical values), not fast or slow.
D. 1.2.1. 5.	the number of hydrogen bonds	the amount of hydrogen bonds	Hydrogen bonds are countables , and so they are quantified by number, not by amount (which is for uncountables like water)

- D.1.2.2. Do not invent new and undefined words that will confuse the reader.

Write:	and not:
Translation products that resemble the wild type protein...	Realistic translation products...

- D.1.2.3. Be **brief** and **precise**.

Write:	and not:
fewer hydrogen bonds	less the amount of hydrogen bonds

- D.1.2.4. **Define your terms.** If the meaning of a word you use is different from its common meaning in the everyday language, then it must be defined. The same applies for words that may have different meanings in different areas, such as 'expression' and 'stability'. If you use two words in the same sense then this must be explicitly stated, otherwise people will use the meanings that they know from their own everyday language. See below (D.2.) for a list of words to watch, and their definitions.
- D.1.2.5. **Use the same term for the same thing**, throughout your document. Otherwise readers will be confused.

Write:	and not:	Remarks:
class I molecules	MHC class I proteins <i>and</i> class I <i>and</i> class I molecules <i>and</i> class I proteins	Stick to one name for one protein throughout the entire document.

D.1.3. Write **what is**, and not what is not.

Write:	and not:
The pellet is loose.	The pellet is not compact.

D.1.4. Avoid lab jargon.

	Write	and not:
D.1.4.1.	assess, investigate, analyze, study	check, look at
D.1.4.2.	separate on gel	run on gel
D.1.4.3.	laboratory	lab
D.1.4.4.	microcentrifuge tube	Eppi, eppendorf tube
D.1.4.5.	immunoprecipitated	IPed, pulled

D.1.5. **Do not capitalize** words, expressions, or names of molecules. Use underlines if you would like to show how an abbreviation was generated. But: when referring to figures and tables, capitalize the words "Figure" and "Table".

Write:	and not:
peptide loading complex	Peptide Loading Complex
T cell receptor	T Cell Receptor, T cell Receptor
MHC class I molecule	MHC Class I Molecule, MHC class I Molecule
We next performed an immunoprecipitation (Figure 5).	We next performed an immunoprecipitation (figure 5).

D.1.6. Consistency of terms

- D.1.6.1. Be consistent in naming items or phenomena. Once you have defined a name for something, stick to it. Example: When you define the term 'conformational flexibility' of a protein, continue using this term and do not use 'flexibility' later instead, since people might assume that that is something else.

D.1.7. Abbreviations

- D.1.7.1. Abbreviations generally confuse readers that are not familiar with the field. Use as few abbreviations as possible. If you use an abbreviation less than ten times, consider not abbreviating. If you are not going to use an abbreviation, do not introduce it.
- D.1.7.2. All abbreviations must be defined when they are first used, especially unconventional ones that you have invented yourself.
- D.1.7.3. Abbreviations are introduced with the long version first, then the abbreviation in brackets, like this:

Write:	and not:
...the transporter associated with antigen processing (TAP)...	...the TAP: transporter associated with antigen processing... <i>or</i> ...the TAP (transporter associated with antigen processing)...

- D.1.7.4. Don't overuse unusual abbreviations. Define a maximum number of five new abbreviations in your document. If in doubt whether to abbreviate or not, don't.
- D.1.7.5. Explain all abbreviations in a footnote where the first abbreviation is used (that is usually still on the first page). If it is a large document (e.g., an MSc or PhD thesis), you can have an extra page with the explanation of all abbreviations.
- D.1.7.6. If you introduce an abbreviation then use it throughout your document. Do not alternate with the long version, this will confuse people.
- D.1.7.7. Do not use the following abbreviations in the flowing text: min (minute), wt (wild type), et al (see D.4.4.)

D.1.8. Numerical increases and decreases

- D.1.8.1. To describe numerical increases, use -fold (1.5 fold, 2 fold, 200 fold).
- D.1.8.2. To describe numerical decreases, use % reduction (20% reduction, 99% reduction) or decrease to % (decreased to 20% of the original value).

Write:	and not:
The number of live cells decreased to 50%.	The number of live cells decreased by a factor of two.
There were only 20% of the frogs left.	There were fivefold fewer frogs.

D.1.9. Avoid 'marketing words' and superlatives.

Write:	and not:
This method is used frequently.	This method has become immensely popular.
Polyelectrolyte microcapsules are versatile and multi-functional tools.	Polyelectrolyte microcapsules provide an unmatched degree of versatility and multi-functionality.

D.2. Specific words

- D.2.1. Here is a list of **words that should generally be avoided** because of their weak or ambiguous meaning:

Do not use:	Write instead:
imply	
using...	with...

- D.2.2. **Words that are often misunderstood** or that have several different meanings

--	--	--

	This word	means:	Comment:
D. 2.2.1.	Illustrate	Explain with a specific example	
D. 2.2.2.	To overlay	To put sth. on top of something else (e.g. red and green microscopy images)	
D. 2.2.3.	To overlap	To coincide (the red and the green signals overlap)	
D. 2.2.4.	Therefore	Because of that	
D. 2.2.5.	Stability	<i>many things</i> 😊	Do not use 'Stability' without a qualifying adjective, such as 'conformational'
D. 2.2.6.	Flexibility	Ability to bend (applies to a protein or a complex structure)	
D. 2.2.7.	Mobility	Ability to move (applies to any object, including an atom)	
D. 2.2.8.	Expression	<i>Immunology:</i> Surface presence (of a protein) <i>Cell Biology:</i> Transcription (of a gene)	

- D.2.3. Scientific **spelling** specials, including some specific to immunology or from our lab:

	Write:	and not:
D.2.3.1.	on-rate	on rate, onrate
D.2.3.6.	alpha helix	helix, -helix, alpha-helix
D.2.3.7.	beta strand (or beta sheet)	strand, b strand
D.2.3.9.	MHC class I molecule	MHC Class I molecule
D.2.3.10.	T cell receptor	T Cell Receptor
D.2.3.11.	class I, tapasin, calreticulin	Class I, Tapasin, Calreticulin
D.2.3.12.	endoplasmic reticulum	Endoplasmic Reticulum
D.2.3.13.	Golgi apparatus	golgi apparatus
D.2.3.14.	<i>cis</i> -Golgi, <i>trans</i> -Golgi	cis-Golgi, trans-Golgi
D.2.3.15.	α_1 domain (<i>of an MHC class I molecule</i>)	alpha1 domain, alpha 1 domain, a1 domain, 1 domain
D.2.3.16.	beta-2 microglobulin	beta 2 microglobulin, beta 2-microglobulin, b2-microglobulin, ...
D.2.3.17.	β_2^m	b2m, b2M, β_2^M , 2m
D.2.3.18.	H-2K ^b	H2-K ^b , H-2Kb
D.2.3.19.	HLA-A*02:01	HLA-A*0201, HLA-A*02

D.2.4. 'That' and 'which'

- D.2.4.1. '**Which**' is when you are really only considering one of the kind: "The endoplasmic reticulum, which is spread throughout the cell,...". '**That**' is when you are looking at one object out of a group of several similar or identical ones: "The cell that is on top seems dead to me." A good way to remember: "A good rule of thumb is this: if the that/which clause can be taken away and you still understand the reference, it must be a which. If you take it away and you're unsure about which one it is, it must be a that." (www.glosophilia.org)
- D.2.4.2. 'Which' always comes with a comma before it (unless the 'which' sentence is in brackets or parentheses). 'Remember the **comma witch!**' T here is no comma before 'that'.
- D.2.4.3. More information on relative clauses is at [Wikipedia](https://en.wikipedia.org/wiki/Relative_clause)
- D.2.4.4. 'Which' should always refer to the immediately preceding word, otherwise the sentence becomes obscure.

Write:	and not:
The force field of a system describes its potential energy, which depends on the coordinates of its atoms.	The force field describes the potential energy of the system, which depends on the coordinates of its atoms.

D.2.5. 'Like' and 'such as'

- D.2.5.1. 'Such as' refers to a group of items that include the first item. Example: "There are many different simulation programs, such as AMBER and Gromacs".
- D.2.5.2. 'Like' refers to a group of items that exclude (= are different from) the first item. Example: "There are many other frogs like this one." In any other context, try to avoid a simple 'like' because it can lead to very confusing sentences.

Write:	and not:	Remark:
They do not show partial EndoF1-resistant bands, indicating that they are not retained in the early secretory pathway. This makes them similar to the wild type gp40. Or: They do not show partial EndoF1-resistant bands, indicating that just like the wild type gp40, they are not retained in the early secretory pathway.	The mutants do not show partial EndoF1-resistant bands, indicating that they are not retained in the early secretory pathway like the wild type gp40.	Is the wild type gp40 retained in the early secretory pathway or not? Impossible to say from this sentence.

D.2.6. Correct use of the definite and indefinite articles in English

- D.2.6.1. If you are talking about one specific object (either because there is only one, or because you are looking at one particular member of a group), ALWAYS use 'the' in front of the word. Typical usage for 'the': **the** Golgi, **the** ERGIC. **The** mouse in my room needs to go away.
- D.2.6.2. Sometimes, instead of 'the', one can omit the article altogether.

Write:	and not:
Loss of TMED9 in HeLa cells causes the loss of ERGIC clusters.	A loss of TMED9 in HeLa cells causes a loss of ERGIC clusters.

- D.2.6.3. Typical usage for 'a': Tapasin is **a** component of the loading complex. **A** mouse ran down the hall.
- Look at <http://esl.fis.edu/grammar/rules/article.htm> or the BBC Learning English website for a more thorough explanation - this is difficult for many non-native speakers.

D.2.7. Correct use of hyphens in nouns and adjectives

- D.2.7.1. **Adjectives** that are composed of several words (= compound adjectives) are hyphenated. Example: if an amino acid is at the carboxy terminus of a peptide, it is called "carboxy-terminal". Since the two words together form one adjective, there is a hyphen.

	Write:	and not:
D.2.7.1.1.	amino-terminal, N-terminal	amino terminal, N terminal
D.2.7.1.2.	high-affinity peptide	high affinity peptide
D.2.7.1.3.	peptide-receptive	peptide receptive
D.2.7.1.4.	concentration-dependent	concentration dependent
D.2.7.1.5.	tapasin-dependent	tapasin dependent
D.2.7.1.6.	conformation-specific	conformation specific

- D.2.7.2. **Nouns** that are composed of several words are usually not hyphenated. Example: one end of a peptide is called the amino terminus (without a hyphen). Exceptions to this rule exist, see D.2.3.

	Write:	and not:
D.2.7.2.1.	carboxy terminus	carboxy-terminus
D.2.7.2.2.	C terminus	C-terminus
D.2.7.2.3.	steady state	steady-state
D.2.7.2.4.	peptide binding groove	peptide-binding groove
D.2.7.2.5.	F pocket	F-pocket

D.2.8. Other interesting common mistakes:

	Write:	and not:	Remark:
D.2.8.1.	First, ...; second, ...; third, ...	Firstly, ...; secondly, ...; thirdly, ...	(in an enumeration)

D.3. Word forms

D.3.1. Apostrophe

- D.3.1.1. The genitive with apostrophe can only be used proper names.

Write:	and not:
the dynamics of the system	the system's dynamics
the function of tapasin	tapasin's function

- D.3.1.2. Avoid the apostrophied short forms of verbs.

Write:	and not:
we will see	we'll see
this did not have the same effect	this didn't have the same effect

D.3.3. Headings

- D.3.3.1. **Capitals in headings:** Use either Title case (A Frog Found In The Swimming Pool) or Sentence case (A frog found in the swimming pool). Do not mix these forms in the document.
- D.3.3.2. Headings have no colons or periods at the ends.

Write:	and not:
Work plan	Work plan:
Background information on tapasin	Background information on tapasin.

D.3.4. Italics

- D.3.4.1. Latin words should be italicized: *cis*-Golgi, *trans*-Golgi (but medial Golgi), *i.e.*, *e.g.*, *et al.*

D.3.5. Nonbreaking (hard) spaces:

- D.3.5.1. In the expression "class I", and in similar expressions, the space should be a nonbreaking (hard) space to make sure the class and the I do not end up on separate lines.
- D.3.5.2. Between number and unit (20 µl) there is always a nonbreaking space.
- D.3.5.3. The spaces in 'Figure 1' and 'Table 1' are also nonbreaking spaces.
- D.3.5.4. **Mac:** alt-Space, **PC:** ctrl-shift-Space .

D.3.6. Subject-verb agreement

- D.3.6.1. In English, a subject in the singular is followed by a verb in the singular, and a subject in the plural is followed by a verb in the plural.

Write:	and not:
Side chains fit into binding pockets.	Side chains fits into binding pockets.
mCMV infection results in birth defects.	mCMV infection result in birth defects.

D.4. Scientific issues in word choice and word use

D.4.1. Correct scientific names

- D.4.1.2. Write the systematic names of organisms in **italics**, e.g. *E. coli*, *S. cerevisiae*.
- D.4.1.3. Bacterial strains and yeast strains are named (in the Springer lab) with SPBxxx and SPYxxx, respectively, where xxx is a number. Please ask which number your strains have.
- D.4.1.4. Cell lines and antibodies have their names, too - make sure you get them right, and don't use fantasy punctuation (like 25-D1-16). The data and references for our antibodies are on the Springerwiki [here](#).
- D.4.1.5. Plasmids often have names or numbers (different from the name of the strain in which you got them). Please ask which name or number your plasmid has. Plasmids bought from companies, e.g. pBLUESCRIPT SKII(-), and plasmids obtained from other people, e.g. p23-CFP, retain their original names. Plasmids that come from a bacterial strain from the Springer group database may also be named pSPBxxx (with xxx, the number of the strain in the database), since this is unequivocal.

- D.4.1.6. Nomenclature of MHC class I molecules is exactly as follows: H-2D^b (for murine alleles) and HLA-A2 or HLA-B*44:05 (for human alleles). The hyphen is a nonbreaking hyphen (Mac: cmd-shift-hyphen, PC: ctrl-shift-hyphen).
- D.4.1.7. Restriction enzymes have Roman numerals, e.g. HindIII, and they are not written in italics anymore.
- D.4.1.8. Knock-out cell lines are designated with "minus slash minus" superscript like this: "TAP2^{-/-} murine fibroblasts". Cell lines that are not knock-outs but mutants (like T2) may not be called knock-outs.
- D.4.1.9. The writing of names of genes is usually tightly regulated. Usually, genes and also genetic mutants are written in *italics*. Upper- or lowercase are also not accidental. Examples for gene names are *m152* (cytomegalovirus), *HsrC* (*E.coli*), *SEC31* (*S. cerevisiae*), *TAPA S/W* (human).
- D.4.1.10. In names that contain hyphens, such as RAE-1, the hyphen is a nonbreaking hyphen (Mac: cmd-shift-hyphen, PC: ctrl-shift-hyphen).

D.4.2. Numbers and units: use and format

- D.4.2.1. For numbers that are used in the text, please separate every three digits with a **nonbreaking space** (write "1 616 116 rabbits", not "1616116 rabbits"). Do not use a comma or a dot to separate digits; only use the decimal point. See below D.4.3.2. for what a nonbreaking space is.
- D.4.2.2. The "times" sign (e.g. in "16 100 x g ") should be a small cross, for example the small letter x in Arial or Symbol fonts, not a letter in a Serif font, e.g. Times or Courier. There is a (nonbreaking, see D.4.3.2.) space before and after it.
- D.4.2.3. The minus sign in front of a number should be a **nonbreaking hyphen** (Mac: cmd-shift-hyphen, PC: ctrl-shift-hyphen) so that it does not get separated from the number by a line break.
- D.4.2.4. In the introduction, results, and discussion sections, **numerals from one to twelve should be written as words**, e.g. 'eight subunits' (not '8 subunits'). Also write 'eighth' (not '8th') and 'threefold' (not '3fold'). In the materials and methods section, numbers may be used.
- D.4.2.5. Abbreviated ordinals (such as '1st') may not be used.
- D.4.2.6. In the narrative text (introduction, results, discussion), do not use enumerations such as 1) ... 2)... 3)... . These are reserved for numerical lists.

D.4.3. Numbers and units: Spaces

- D.4.3.1. Between a number and a unit there should be one space. (Exception: the percent sign, %).
- D.4.3.2. The space should be a **nonbreaking** (hard) space (Mac: alt-Space, PC: ctrl-shift-Space) to make sure the number and the unit do not end up on separate lines.
- D.4.3.3. Between a minus sign and a number there is no space.

	Write:	and not:
D.4.3.3.1.	10 µl	10µl
D.4.3.3.2.	37 °C	37°C, 37° C
D.4.3.3.3.	1 M	1M
D.4.3.3.4.	16 100 x g	16 100xg
D.4.3.3.5.	10% APS	10 % APS
D.4.3.3.6.	pH 7.2	pH7.2

D.4.4. 'et al.' vs. 'and collaborators'

- D.4.4.1. If you want to refer to a specific paper in the text, write, for example, "Bouvier *et al.* have shown that hamsters are carnivorous [2]" if Bouvier is the first author of the paper, and [2] is the endnote reference of the paper; alternatively, write "Fritz and collaborators have shown that hamsters are carnivorous [2]" if Fritz is the senior author of the paper. That is, in paper-speak, only senior authors have 'collaborators'.

D.4.5. DNA and protein sequences

- D.4.5.1. For DNA sequences (for example, oligos), always use a font that gives even spacing, like Courier. It helps the reader if you give the designations of the ends and divide the sequence into triads (or codons): 5' GGA TCC AAG CTT 3'.

D.4.6. Fusion proteins, receptor-ligand complexes, mutants: our conventions

- D.4.6.1. In the Springer group, we use hyphens (dashes) to show that things are connected with each other. K^b-GFP is a covalent genetic fusion of K^b with GFP (another example: E3-HA-K^b-GFP).
- D.4.6.2. We use slashes to show that things are in a complex with each other. The class I/peptide complex is a non-covalent association of class I with peptide.
- D.4.6.3. To show that something is mutated, we use a description in brackets that is appended to the molecule name **without a space**. Thus, A*02:01(T134K) is A*02:01, in which residue 134 has been changed to lysine.

E. Individual symbols

	Symbol	Comment

E.1.	" "	Quotation marks should be used as rarely as possible. Do <u>not</u> use them to define something (as in: the protein is called "tapasin"), and do not use them as emphasis (as done in some other languages).
E.2.		This is an alpha. Do not use it to describe the specificity of an antibody (write 'anti-tapasin', not '-tapasin'), and do not use it to abbreviate 'alpha helix'.
E.3.	~	This sign (called a tilde) means "proportional to". If you would like to say "approximately", use .
E.4.	&	The ampersand should never be used, except in the name of a company.
E.5.	©, ®, ™	The copyright and trademark signs should never be used in scientific documents, not even after the name of a reagent.
E.7.	x	If you mean to say "times", such as in '2 x' for 'two times', the x must be in a sans-serif font, for example Arial, since it is actually not a letter but a multiplication sign.
E.8.	ß	Found on a German keyboard: this is the German letter " es-zett " and not a Greek beta. A Greek beta looks like this: . To find it on your computer, use the Symbol font.
E.9.	*	is an asterisk . Asterix , on the contrary, is a Gallic warrior from a comic book. Make sure you don't mix up the two.
E.10.	µ	This is the Greek letter µ (mu) that is used as a prefix in 'µl' (for 'microliters'). Make sure you use the µ and not a small u. On the Mac: alt-m, on the PC: hold down the ALT key and type 0181 on the keypad.

F. Formatting

F.1. Use of styles

- F.1.1. Define a style for your paragraph (standard) font.
 - F.1.1.1. Use Times or Times New Roman in 11 pt or 12 pt for the text.
 - F.1.1.2. Use Arial 10pt for the footnotes and figure legends.
- F.1.2. Use the 'outline numbered' format for **headings**, and format the style for each heading level instead of formatting each heading separately.
 - F.1.2.1. Use Arial 12 to 14 pt bold for the headings.
 - F.1.2.2. Format headings to 'keep with next paragraph' (Home > Paragraph > Line and Page Breaks > Keep with next) such that they are not separated from the following text if the page breaks between them.
- F.1.3. If you do **not** use styles:
 - F.1.3.1. Make absolutely sure that the **font** and the font **size** of the text, the headings, the page headers, the footnotes, the figure legends, and the Endnote references are consistent throughout the document.
 - F.1.3.2. Make absolutely sure that the **first-line indent** of the paragraphs is the same throughout the document.
 - F.1.3.3. Make absolutely sure that the **justification** of the text (i.e., Left-aligned or Block) is identical for all paragraphs in the entire document.
 - F.1.3.4. Make absolutely sure that the line **spacing** is equal throughout the text.

F.2. Placement of text on the page

- F.2.1. The **page margins** must be wide enough. For binding, you will need 3 cm on the left/inner side.
- F.2.2. Never use repeated spaces to place text on a page. Use tab stops instead.
- F.2.3. Never use repeated returns to position a line on the page. Use styles (F.1.) to define a uniform appearance of the text.

F.3. Figures and tables

- F.3.1. Figures
 - F.3.1.1. Figures have legends but no headings (be aware when copying from PowerPoint slides).
 - F.3.1.2. Figures that are not 100% your own work must be credited.
 - F.3.1.3. Do not change the height to width ratio of any images that you insert into your document.
 - F.3.1.4. When copying out of PDF files, enlarge the image on the screen **before** copying out since Acrobat reader takes a copy at the resolution of the screen. (Enlarging the image after pasting will not help.)
- F.3.2. Tables
 - F.3.2.1. Tables have headings but no legends.
 - F.3.2.2. Format the header row of tables such that it repeats at the top of each page, using the option 'Keep with next paragraph' in Word.
 - F.3.2.3. Format each row of a table such that it cannot break at page breaks, using the option 'Do not allow row to break across pages' in Word.
 - F.3.2.4. The text in each box should be vertically centered (i.e., the same distance to the top and the bottom of the box). You achieve this by setting the line spacing, the space before and after each paragraph, and the inner margins of the table cells.
- F.3.3. **Placing figures in Microsoft Word documents**
 - Place the figures at the very end of the writing process when the text is almost final.
 - Place a text box onto the page.
 - Into the text box, place a table.
 - Each field of the table should hold one element of the figure. Examples:
 - If your figure has one panel and a legend, then your table has one column and two rows; the figure goes into the top field of the table, and the legend into the bottom field.

- If your figure has two panels and a legend, then your table has two rows: a top row with two fields, and a bottom row with one field. (Use the 'merge fields' feature to achieve this in Word.)
- Use the field margins feature of Word to space the text and images in the table conveniently.
- Finally, **size** the text box such that it just holds your table, and then **place** the text box at the top of the margin of the page.

F4. References

- F.4.1. There are several possible citation styles for references. If nothing else has been agreed, you may use any of them, but you must use one of them consistently.
 - F.4.1.1. **Numbered** style:
 - F.4.1.1.1. The in-text references are numbers, such as [1].
 - F.4.1.1.2. The numbers of the in-text references must be consecutive in the order they appear in the text.
 - F.4.1.1.2. The entries of the reference list are formatted as follows (note punctuation, bold, and italics!):
[1] S. Fritzsche and S. Springer: Investigating MHC class I folding and trafficking with pulse-chase experiments. *Mol.Immunol.* **55** (2013), p. 126-130.
 - F.4.1.1.3. The entries of the reference list are in numerical order.
 - The Numbered style is recommended only for use with the [EndNote](#) software.
 - F.4.1.2. **Author-year** style:
 - F.4.1.2.1. The in-text references are the author name and the year.
 - F.4.1.2.1.1. If there is one author, it is (Fritzsche, 2013).
 - F.4.1.2.1.2. If there are two authors, it is (Fritzsche and Springer, 2013).
 - F.4.1.2.1.3. If there are three and more authors, it is (Fritzsche *et al.*, 2013). (Note the italics.)
 - F.4.1.2.2. The entries of the reference list are formatted as follows (note way of writing the first author, punctuation, bold, and italics!):
Fritzsche, S., and S. Springer: Investigating MHC class I folding and trafficking with pulse-chase experiments. *Mol.Immunol.***55** (2013), p. 126-130.
 - F.4.1.2.3. The entries of the reference list are in alphabetical order.
 - The author-year style is recommended for all cases where EndNote is not used.

G. Special notes for people from particular corners of the world

G.1. Germany

- G.1.1. Make sure that there is always a **comma** before "and" in the separation of sentences, and in the last member of an enumeration.

	Write:	and not:
G. 1.1.1.	Peter, Paul, and Mary	Peter, Paul and Mary
G. 1.1.2.	The protein is localized in the Golgi apparatus, and it is a peptide transporter.	The protein is localized in the Golgi apparatus and it is a peptide transporter.

- G.1.2. **Hyphenation** is quite different in English from the way it is in German. Usually, in English, there are far fewer hyphens than in German.

	Write:	and not:
G.1.2.1.	N terminus	N-terminus
G.1.2.2.	HA tag	HA-tag
G.1.2.3.	T cell	T-cell

- G.1.3. Further examples of **Germanisms**:

	German	English	Not English
G.1.3.1.	Disulfidbrücken	disulfide bonds	'disulfide bridges'
G.1.3.2.	100.000	100,000	
G.1.3.3.	Restriktionsverdau	Restriction digest	'Restriction digestion'

G.2. India

- G.2.1. **Subject-verb agreement**: Make sure you get **singular and plural** right. A noun in the singular is followed by a verb in the singular, while a noun in the plural is followed by a verb in the plural. See D.3.6.1.
- G.2.2. Make sure you get the definite **articles** ('the') right.

H. Before giving your document to anyone else

- **H.1. Check spelling and grammar:**
 - **Spell and grammar check your document** using the functions of MS Word before giving it to someone else (even for a "quick look").
 - For this to work properly, first select the entire document and set the language to "English (US)" in MS Word.
- **H.2. Read out the text aloud to yourself** and listen to it. Do you think it is pleasantly written and easy to understand?

J. Further reading

- J.1. The best simple guide to style in English is "[The Elements of Style](#)" by Strunk and White (IRC call number PN160 .S772 2000).
- J.2. To develop an excellent writing style, the best thing to do is to read, with an attentive mind, some very well-written papers. Also check: [Good books to read to improve your English](#).
- J.3. Other interesting articles:
 - The BioTechniques [series of articles](#) on writing papers (2013).
 - "[Twenty-One Suggestions for Writing Good Scientific Papers](#)"
 - [On Writing Well](#) by William Zinsser.

K. Software

- The grammar check in Microsoft Office is not sufficient for a proper style check. I do not have much experience with other software. Perhaps the following is what we need:
 - <https://www.grammarly.com>
- In addition, the following writing editor seemed interesting to me:
 - <http://www.hemingwayapp.com>
- Small websites to check individual paragraphs for spelling and style:
 - <https://www.onlinecorrection.com>

L. Online Courses

- "[Writing in the Sciences](#)" on Coursera, recommended by Venkat; also [on YouTube without the exercises](#).
-